

CLAIMS

1. A microstructure which is formed by superimposition of a first relief structure with at least one second relief structure, wherein the first relief structure (5) is a structure which is mechanically produced in a layer (2) and the at least one second relief structure is a diffraction structure (12) which is produced photochemically on the surface of the first relief structure (5) and which has recesses, for example grooves (13).

2. A microstructure as set forth in claim 1 characterised in that the diffraction structure (12) is a diffraction grating.

3. A microstructure as set forth in claim 1 and claim 2 characterised in that the recesses (13) of the diffraction structure (12) are of a depth (t) of at most 500 nm, preferably at most 250 nm.

4. A microstructure as set forth in claim 2 or claim 3 characterised in that the grating period of the diffraction grating (12) is at most 400 nm.

5. A microstructure as set forth in one of preceding claims 1 through 4 characterised in that the first relief structure (5) is a periodic grating structure.

6. A microstructure as set forth in claim 5 characterised in that the diffraction grating (12) is of a spatial frequency which corresponds to at least five times the spatial frequency of the periodic grating structure of the first relief structure (5).

7. A microstructure as set forth in claim 5 or claim 6 characterised in that the diffraction grating (12) and the grating structure of the first relief structure (5) are turned relative to each other at a predetermined azimuth angle.

8. A microstructure as set forth in one of claims 1 (through 4) characterised in that the first relief structure (5) is a matt structure.

9. A process for the production of light-diffracting microstructures (13) in a layer (2) of photoresist on a substrate (1), which are produced by superimpositions of a first relief structure (5) with at least one second relief structure serving as a diffraction structure (12),

characterised by the steps

a) producing a layer (2) of photoresist on a flat substrate (1) which has the first relief structure (5) in the free surface of the layer (2),

b) producing an interference pattern, wherein coherent light is divided into a partial beam (9) and a reference beam (10) and wherein the partial beam (9) and the reference beam (10) are caused to interfere including a predetermined intersection angle on the relief structure (5),

c) orienting the first relief structure (5) in relation to the interference pattern which includes fringes of a high level of light intensity separated by fringes of a low level of light intensity and which illuminates the first relief structure (5),

d) exposing the photoresist layer (2) with the first relief structure (5) by means of the interference pattern during a predetermined time, wherein the material of the photoresist is changed in the fringes of the high level of light intensity,

e) developing the photoresist during a predetermined time, wherein the material of the photoresist which was changed during the exposure operation is partially removed and recesses, for example grooves, (13) of the diffraction structure are produced, and

f) drying the photoresist.

10. A process as set forth in claim 9 characterised in that in step e) the time for development of the photoresist is such that the grooves (13) of the diffraction structure reach a depth of at most 500 nm, preferably at most 250 nm.

11. A process as set forth in claim 9 or claim 10 characterised in that in step a) a relief die (4) mounted on a stamping punch (3) is lowered into the surface of the layer (2) of photoresist and the shape of the first relief structure (5) is produced as a negative of the relief die (4).

12. A process as set forth in claim 9 or claim 10 characterised in that in step a) the layer (2) is produced by casting, wherein the liquid photoresist is cast between the substrate (1) and a relief die (4) and that after solidification of the photoresist under the effect of heat and removal from the mold the free surface of the layer (2) has the first relief structure (5) as a negative of the relief die (4).

13. A process as set forth in one of claims 9 through 12 characterised in that in step a) a periodic grating is shaped in the layer (2) as the first relief structure (5).

14. A process as set forth in claim 13 characterised in that in step b) the intersection angle between the partial beam (9) and the reference beam (10) is so set that a diffraction grating is produced having a spatial frequency which corresponds at least to five times the spatial frequency of the relief structure (5).

15. A process as set forth in claim 13 or claim 14 characterised in that in step c) the first relief structure (5) is oriented in respect of azimuth in relation to a predetermined azimuth value related to the interference pattern by rotation of the substrate (1) about a normal (15) to the plane of the substrate (1).

16. A process as set forth in one of claims 9 through 12 characterised in that in step a) a matt structure is shaped into the layer (2) as the first relief structure (5).

17. A process as set forth in one of claims 9 through 16 characterised in that steps b) through e) are repeated for photostructuring at least one further diffraction structure.

18. A process as set forth in claim 17 characterised in that for step b) the intersection angle between the partial beam (9) and the reference beam (10) is changed.

19. A process as set forth in claim 17 or claim 18 characterised in that the azimuth value of the first relief structure (5) with respect to a first diffraction structure is changed by rotating the substrate (1) about a normal to the plane of the substrate (1).

20. A process as set forth in one of claims 9 through 19 characterised in that in step b) the intersection angle between the partial beam (9) and the reference beam (10) is so set that a diffraction grating with a grating period of at most 400 nm is produced as the diffraction structure.